

REMARKS/ARGUMENTS

Claims 1 and 3-22 are pending in this application and each was rejected in the subject final Office action. No claim amendments are filed herein. Applicants respectfully request re-examination, reconsideration and allowance of each of pending
5 claims 1 and 3-22.

I. Claim Rejections

In paragraph 6, **claims 1, 3, 4 and 9-11** were rejected under 35 U.S.C. § 103(a) as being unpatentable over Park, U.S. Patent No. 6,825,912 in view of Lensing, U.S. Patent No. 6,630,362. In paragraph 13, **claims 5-8 and 12-22** were rejected under
10 35 U.S.C. § 103(a) as being unpatentable over Park in view of Lensing and in further view of Saka, et al., U.S. Patent No. 6,798,529 (hereinafter "Saka").

Applicants respectfully submit that each of these claim rejections is overcome for reasons set forth below.

It is an old adage and uncontroverted (see, infra) that an Examiner is not free to
15 pick and choose elements from one reference or multiple references and indicate that their combination is obvious, if the only motivation to combine them is from the claimed invention itself. The Examiner cannot tie such unrelated features together using the claimed invention as a roadmap and then reject the claimed invention as being obvious if there is no motivation or suggestion to combine the elements, other than as provided
20 in the claimed invention. For example, suppose a reference teaches, in one section, monitoring the intensity of illumination and altering exposure energy or exposure time based on variations in illumination intensity. Further suppose that in another section, the reference teaches monitoring thickness of a deposited film and using this thickness variation to modify a mechanical polishing process used to produce the film thickness.
25 These are two completely separate, different and unrelated operations. It would not be appropriate under the tenets of 35 U.S.C. § 103 to reject a claim by then saying that it would be obvious to take the variation of illumination from the exposure operation and

input this variation to modify or control the mechanical polishing process to produce a desired film thickness simply because they are taught in the same reference. This is so because they are two completely different technologies. There would be no suggestion or motivation anywhere to take an aspect of one procedure and integrate it into the other procedure unless the reference itself or general skill in the art provided some motivation or suggestion. Similarly, if this same reference taught an annealing operation, it would not be proper to state that it would be obvious to change the heating parameters of the annealing operation that heats an oxide film, based on variation in illumination across a wafer while forming a pattern on a polysilicon film.

It is not appropriate to pick and choose features of unrelated processes and tie them together to reject a claim, under the conditions of 35 U.S.C. § 103(a).

The invention is patentable due to the novel combination of features. A holding that combination claims are invalid based merely upon finding similar elements in separate prior art patents would be contrary to statute and would defeat the congressional purpose in enacting title 35. *Smithkline Diagnostics, Inc. v. Helena Labs. Corp.*, 859 F.2d 878, 8 USPQ2d 1468 (Fed. Cir. 1988). A patented invention cannot be invalidated piecemeal by finding individual features separately in the prior art – especially when they are taken from unrelated operations. The hindsight reasoning employed in using the invention as a roadmap to find its prior art components, would discount the value of combining various existing features or principles in a new way to achieve a new result – often the very definition of invention.

In *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1740-41 (2007), the Supreme Court stated:

[o]ften, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether

there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue.

Applicants respectfully submit that the Examiner has not shown any reason, much less a suggestion or motivation as required in *Ruiz v. AB Chance Co.*, 357 F.3d 1270, 69 USPQ2d 1686, 1690 (Fed. Cir. 2004), before the invention itself, to make the claimed combination. Rather, hindsight reconstruction was impermissibly used to select particular features from different references, to arrive at the inventive, claimed combination of features. "It is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teaching of the prior art so that the claimed invention is rendered obvious. This court has previously stated that "[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention". *In re Fritch*, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992) at USPQ2d 1783-84 (quoting *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988)).

Applicants believe the reason that the Examiner has not shown why one would make the claimed combination based upon the references, is because there is no such suggestion to combine the references and, in fact, the Park reference absolutely teaches away from the combination as proposed by the Examiner.

Each of independent claims 1 and 12 recite the novel feature that thickness measurements of a subjacent device layer in a semiconductor device is used to control the exposure energy used in patterning another, different device layer (i.e., non-photoresist layer) disposed over the subjacent device layer. Independent claim 1 recites:

further controlling the exposure energy with a feed forward process control signal of a compensation amount that compensates for thickness variations in a subjacent layer beneath a top layer, by combining the feed forward process control signal with the feedback process control signal to control the exposure energy used in patterning the top layer; and

the top layer being a non-photoresist layer.

Independent claim 12 recites the features of:

5 a feed forward controller providing a feed forward control signal to an exposure apparatus based on a thickness measurement of an interlayer;

10 a feedback controller providing a feedback exposure energy control signal to the exposure apparatus based on critical dimension measurement of a top layer of a second patterned wafer substrate of a previous manufacturing lot, the critical dimension being one of a width, a spacing and an opening of the second patterned wafer substrate; and

the top layer being a non-photoresist layer.

15 In each case, the top layer is recited to be non-photoresist layer. It is thus inherent that the top layer being patterned is a device layer as it is uncontroverted and understood by one of ordinary skill, that a consumable photoresist layer is not a device layer as it does not form part of a device. In other words, the layer being patterned and the underlying layer whose thickness influences the patterning of the top layer, are both device (i.e. non-photoresist) layers. The claims further recite that the exposure energy used in exposing and patterning this top device layer is controlled by a feed forward
20 signal based on the thickness or thickness variation of a subjacent device layer.

As a first matter, each of claims 1 and 12 recites controlling exposure energy, not time. Park only controls exposure time.

25 Further, none of the references teach using the thickness of one device layer to control the exposure energy in another device layer. Again, the recitation of the top layer being a non-photoresist layer requires that the subjacent layer and top layer in claim 1 are **different device layers** and also that the interlayer and top layer of claim 12 are **different device layers**.

Park does not provide this feature. In the Park reference, an uppermost device layer is being patterned. It is the thickness of this same uppermost device layer that is

used to influence the exposure time in the lithography process used to pattern this layer. The Office action does not allege that Park provides the claimed feature because the Office action, while alleging that Park teaches "a feed forward process control signal of a compensation amount that compensates for thickness variations in a subjacent layer beneath a top layer" concedes that Park "does not expressly teach to exposure energy ... and [Park does not expressly teach] the top layer being a non-photoresist layer". This omission and distinction is significant because the layer alleged to be Park's "subjacent" layer in the action, is actually the uppermost device layer and, while Park logically uses a photoresist layer to pattern this upper device layer, it is the thickness of the same device layer used to control its exposure time. Park is therefore acknowledged to be limited to controlling the exposure time of a layer based on the thickness of that same device layer. The Office action therefore concedes that A] Park does not control exposure energy and B] Park cannot and does not teach the features of using the thickness of a subjacent device layer to control the exposure energy of another device (i.e. non-photoresist) layer. Each of claims 1 and 12 is therefore distinguished from Park.

The Office action then relies upon Lensing for teaching the feature of the top layer being a non-photoresist layer and for controlling exposure energy. Applicants respectfully submit that 1) one would not combine Park with Lensing and 2) even if one did attempt to combine the references, the claimed invention would not result.

1) The Examiner cites cases and MPEP excerpts citing that "disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments". This is not applicable to the case at hand. The entire disclosure of Park is directed to changing exposure time so that the amount of exposure energy does not have to be changed. Park is titled "System For Adjusting a Photo-Exposure Time". The objective in Park is to avoid having to vary exposure energy. Park therefore teaches away from combination with any reference that

changes exposure energy. One would not combine Park with Lensing as suggested by the Examiner.

2) The portion of Lensing cited for providing the top surface being a non-photoresist layer, is in column 7, lines 39-44 and 53-59. Applicants respectfully submit
5 that the reason Lensing discusses a top layer being a non-photoresist layer in this portion of the Lensing patent is because this portion of the Lensing patent is not directed to a photolithography process. Rather, this portion is directed to an unrelated mechanical polishing process.

10 In column 7, and in the block diagram of FIG. 7 referred to in column 7, Lensing provides a top layer being a nitride film, data acquisition regarding the amount of nitride film that has been polished off the wafer, and feedback information for modifying the polishing process to arrive at the desired thickness of the nitride film. This is absolutely
15 unrelated to photolithography or exposure considerations. The measurement of a film thickness for a film being mechanically polished to modify the polishing process for polishing that film bears no relation to using a film thickness to modify an exposure setting. Just because Lensing provides using a film thickness as a feed forward for a process control step (directed to mechanical polishing) does not support any contention that Lensing, in combination with Park, teaches or suggests using a film thickness to
20 modify an exposure setting. Moreover, nowhere does Lensing even teach using any measurement of one device layer to control processing of another device layer. Therefore, Lensing, in combination with Park, certainly does not teach using film thickness of one layer to modify an exposure setting for another device layer above that layer. The ONLY teaching to use one device layer to influence exposure energy used to pattern a second device layer, is from Applicants' claimed invention.

25 Independent claims 1 and 12 are therefore distinguished from Park in view of Lensing. Each of the dependent claims are also distinguished from Park in view of Lensing. The rejection of claims 1, 3, 4 and 9-11 should be withdrawn.

With respect to claims 5-8 and 12-22 rejected as being unpatentable over Park in view of Lensing and further in view of Saka, Saka has apparently been relied upon for teaching measurement of thickness remaining of an interlayer after chemical mechanical planarization thereof. Saka does not make up for the above stated deficiencies of Park and Lensing rendering independent claim 1 distinguished from the combination of Park, Lensing and Saka. Claims 5-8 are similarly distinguished by virtue of their dependencies from claim 1 and therefore the rejection of claims 5-8 under 35 U.S.C. § 103(a), should be withdrawn.

With respect to independent claim 12, Saka has apparently also been relied upon for providing CD measurement of a second manufacturing lot. Applicants respectfully submit that Saka does not a) make up for the above stated deficiencies of the combination of the stated references and b) Saka does not even provide the feature for which it is relied upon. The sections of Saka pointed out on page 10, first and second paragraphs of the Office action, do not refer to processing of subsequent lots of material, but rather to *successive wafers of a lot*, more particularly, "run-to-run" data in a single wafer processing tool.

At any rate, Saka does not make up for the above stated deficiencies of Park and Lensing and because independent claim 12 is distinguished from Park, Lensing (and the AAPA), claim 12's dependent claims – claims 13-22 – are also distinguished from the combination of references.

As such, the rejection of claims 12-22 under 35 U.S.C. § 103(a), should be withdrawn.

CONCLUSION

Based on the foregoing, each of pending claims 1 and 3-22 is in allowable form and the application in condition for allowance, which action is respectfully and expeditiously requested.

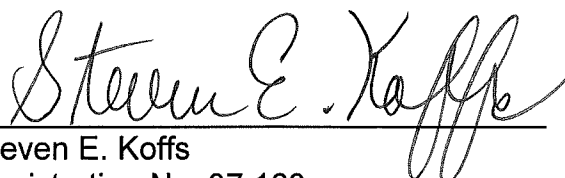
5 The Assistant Commissioner for Patents is hereby authorized to charge any fees necessary to give effect to this filing and to credit any excess payment that may be associated with this communication, to Deposit Account 04-1679.

Respectfully submitted,

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